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ABSTRACT

The focus of this study is on the possible effects of phonological interference on the reading achievement of Spanish-speaking Puerto Rican first graders. Specifically, the study explored the relationship between standard English auditory discrimination and first-grade reading achievement. Subjects for the study were 32 female and 20 male students from six Trenton, New Jersey, elementary schools. The instruments used were the two forms of the experimental auditory discrimination test and Form 1 of the Gates-MacGinitie Reading Test. Results show that low positive but significant correlations were found between scores on both forms of the auditory discrimination test and composite reading scores, between scores on both auditory discrimination test forms and vocabulary subtest scores, and between scores on Form II of the auditory discrimination test and comprehension subtest scores. A bibliography and six appendixes containing material related to the study are included in the thesis. (JM)

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AUDITORY DISCRIMINATION AND READING ACHIEVEMENT OF PUERTO RICAN SPANISH-SPEAKING FIRST-GRADE STUDENTS

A THESIS

SUBMITTED TO THE FACULTY

OF THE GRADUATE SCHOOL OF EDUCATION

OF

RUTGERS UNIVERSITY

THE STATE UNIVERSITY OF NEW JERSEY

BY

JUDITH ANN SPRINGER

IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE

OF

MASTER OF EDUCATION

NEW BRUNSWICK, NEW JERSEY JANUARY 1975

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DEAN: _____

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TABLE OF CONTENTS

Page

ACKNOWLEDGMENTS ii

LIST OF TABLES vi

LIST OF FIGURES vii

Chapter

I. THE PROBLEM 1

Background of the Problem 1

Statement of the Problem 2

Hypotheses 2

Importance of the Study 4

Definitions of Terms 5

Limitations of the Study 6

II. REVIEW OF THE LITERATURE 9

English and Spanish Phonological Systems 9

A Contrastive Analysis of English and Spanish Phonologies 11

Consonant Comparison 12

Vowel Comparison 15

Phonotactics 19

Divergent Dialects of American Spanish . . 21

Auditory Discrimination 24

TABLE OF CONTENTS (continued)

Chapter		Page
	Auditory Discrimination and Socio-economic Status	24
	Auditory Discrimination and Reading	27
	Correlation Studies	28
	Good Versus Poor Reader Studies	29
	Predictive Studies	30
	Auditory Discrimination Problems of Spanish-Speaking Children	32
	Standard English Auditory Discrimination and Reading of Non-Standard English-Speaking Children	35
	Summary	36
III.	PROCEDURE	38
	Development of the Auditory Discrimination Test	38
	Subjects	44
	Instruments	45
	Procedure	45
	Data Analysis	48
	Summary	49
IV.	RESULTS AND DISCUSSION	51
	Results	51
	Discussion	56
V.	SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	64
REFERENCES		67

TABLE OF CONTENTS (continued)

Page

APPENDIXES

A. Informal Interview Form 72

B. Income Scale for Federal Lunch Program . . . 74

C. Standardized Pretraining Session 77

D. Gates-MacGinitie Reading Test, Primary A, Form 1 81

E. Pilot Auditory Discrimination Test 83

F. Final Forms I and II of the Experimental Auditory Discrimination Test 85

LIST OF TABLES

Table		Page
1.	Phoneme Symbols Used in This Study	13
2.	Comparison of Consonant Phonemes of English and Spanish	14
3.	Comparison of Vowel Phonemes of English and Spanish	18
4.	Fourteen Puerto Rican Spanish-English Phoneme Confusions	25
5.	Difficult Items in Wist's Pilot Study	33
6.	Difficult Phoneme Contrasts in Sardy's Study	34
7.	Phonemic Contrasts Represented by Items on the Experimental Auditory Discrimination Test	40
8.	Total Number of Students, Percentage of Spanish-Speaking Students, and Percentage of Students Receiving a Free Federal Lunch in the Six Schools in the Study	46
9.	Spearman Rank Correlation Coefficients for Auditory Discrimination Scores and Reading Test Scores	53
10.	Breakdown of Total Auditory Discrimination Test Errors into Errors on PRD Items and Errors on SSD Items	55
11.	Total Number of Responses and Error Responses on Auditory Discrimination Test Items with Initial, Medial, and Final Contrasts	57
12.	Above and At-Or-Below Median Errors for Initial, Medial or Vowel, and Final Contrast Items on Auditory Discrimination Test	58
13.	Auditory Discrimination Test Items with Above-Median Number of Error Responses	59

LIST OF FIGURES

Figure		Page
1.	English Vowels Grouped by Place of Articulation	17
2.	Summary of Problems of Phonemic Differentiation for Spanish-Speakers Learning English	20

CHAPTER I

THE PROBLEM

Background of the Problem

In eastern urban centers, in Florida, in the Southwest, and in California, growing segments of our population speak Spanish as a native language. Thousands of children from these groups--Puerto Rican, Cuban, Mexican-American--begin school each year speaking little or no English. The low socioeconomic status of many Spanish-speaking families further compounds the children's educational problems (Macmillan, 1970).

An estimated 400,000 Puerto Rican children attended mainland schools in 1970. Generally, these children lagged behind both urban whites and urban blacks in English reading comprehension and verbal ability (Andersson & Boyer, 1970). According to Diego Castellanos, Director of the Office of Bilingual Education of the New Jersey State Department of Education, New Jersey has approximately 85,000 Spanish-surnamed public school pupils, about one-fourth of whom have enough trouble with English to be seriously disadvantaged academically (personal communcation, October 17, 1974).

To read any language successfully, the reader must be able to identify and reproduce the phonology (sound system), vocabulary, stress and intonation, and grammatical features of that language (Fowler, 1969). When the reader is a native speaker of a different language, linguistic interference[1] may arise from the distinctive features of his native tongue. This study will concentrate on the possible effects of phonological interference on reading achievement.

Statement of the Problem

In the present study, Puerto Rican Spanish-speaking first-grade students were the subjects of an investigation of the following questions:

1. Which standard English phonemes are difficult for these children to discriminate?

2. Are these auditory discrimination problems related to their reading achievement?

Hypotheses

The following hypotheses guided the investigation:

1. There will be no significant correlation between scores on Form I of an experimental auditory discrimination test and composite scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

---

[1]Linguistic interference occurs when the distinctive features of the native language act to impair perception and production of the new language.

2. There will be no significant correlation between scores on Form II of an experimental auditory discrimination test and composite scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

3. There will be no significant correlation between scores on Form I of an experimental auditory discrimination test and vocabulary subtest scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

4. There will be no significant correlation between scores on Form II of an experimental auditory discrimination test and vocabulary subtest scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

5. There will be no significant correlation between scores on Form I of an experimental auditory discrimination test and comprehension subtest scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

6. There will be no significant correlation between scores on Form II of an experimental auditory discrimination test and comprehension subtest scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

Two supplemental hypotheses referred to the analysis of errors on the auditory discrimination test:

7. There will be no significant difference between errors on items designated as especially difficult for Puerto Rican speakers of Spanish and errors on the

remaining items expected to be difficult for Spanish-speakers in general.

8. There will be no significant difference among errors on items with initial phonemic contrasts, errors on items with medial or vowel phonemic contrasts, and errors on items with final phonemic contrasts.

Importance of the Study

The need for research on the language and reading of the linguistically different disadvantaged child has been underlined by Wanat (1971):

> The children who very much need the concentrated and interdisciplinary study of reading specialists, psychologists, linguists, and sociologists are the bilingual and bidialectal youngsters in the ghettoes and barrios and on the reservations. . . . The overwhelming majority of these children are asked to read in a language that is strange to them. The child is presented with a graphic pattern and asked to decode these marks into a set of sounds, morphological units, words and syntactic patterns which he speaks for a few minutes per day to his teacher, if he speaks to her at all [p. 120].

While contrastive analyses of Spanish and English phonologies have suggested "expected" auditory discrimination problems, few controlled studies have demonstrated that these expected problems in fact occur. The present study explored the relationship between actual Spanish-English auditory discrimination problems and reading achievement for a group of Puerto Rican Spanish-speaking first-grade students.

The findings of this study may be useful for the design of phonics programs for Puerto Rican Spanish-speaking children and may also guide teachers in their introduction of new sounds via sight vocabulary. Additionally, classroom teachers may use the experimental auditory discrimination test itself as a screening device for the detection of phonological problems in these children. They will then be able to design individualized phonics programs which focus on the actual auditory discrimination problems of their Spanish-speaking students.

Definitions of Terms

Auditory discrimination. The capacity to distinguish between phonemes, or individual speech sounds, used in speech (Wepman, 1960). Operationally defined, the term refers to scores received on the experimental auditory discrimination test used in this study.

Phoneme. A speech sound; the minimum sound unit which, if changed, will change meaning (Fry, 1972).

Phonemic difference. A sound difference which signals a difference in meaning.

Minimal pair. A pair of words which differ in only one phoneme.

Contrastive analysis. Comparison of the phonology, syntax, intonation, vocabulary, and orthography of two languages in order to predict and describe the problems a

speaker of one may have in learning the other.

Spanish-speaking child. Operationally defined, a child who answers affirmatively at least one of the questions on the Informal Interview form employed in this investigation (see Appendix A).

Puerto Rican child. Operationally defined, a child whose school permanent record card indicates that he or at least one of his parents was born in Puerto Rico.

Child residing in a low-income area. Operationally defined, a child who attends a school in which at least 50% of the student body qualifies for a free lunch under the Federal Lunch Program (see Appendix B for income requirements).

Reading achievement. Operationally defined, the scores received on the Gates-MacGinitie Reading Test, Primary A, Form 1 (see Appendix D).

Limitations of the Study

The findings of this investigation should be interpreted in light of the following limitations. First-grade students were chosen for the study because of the importance of early detection of reading problems and because auditory discrimination is a more important component of early reading than of reading in the intermediate grades. However, it should be noted that auditory discrimination has been found to be a developmental skill

which, in some children, may not mature until the middle of second grade (Wepman, 1960). The performance of some children in the study may have been due in part to immature perceptual ability rather than linguistic factors, thereby affecting the results of the study.

A second limitation applies to the type of population studied, Puerto Rican Spanish-speaking first-graders living in a low-income urban area. Results might not be applicable to similar children of different ages or to children from different linguistic or socioeconomic backgrounds.

Additionally, the criteria for participation in the study (no speech or hearing defects, Spanish spoken in the home, native Puerto Rican or with one Puerto Rican-born parent, ability to complete successfully the Standardized Pretraining Session, Appendix C) may seriously restrict generalizability of results. Spanish-speaking populations in public schools may include many children who do not meet these criteria.

The testing of auditory discrimination was limited to performance on a very specific task, the making of same-different judgments of isolated minimal pairs, which may be too remote from the kinds of discrimination skills required in the first-grade classroom.

Another limitation applies to the testing of

disadvantaged children in general. Severson and Guest (1970) have suggested that the following factors might attenuate the validity of such testing: disruptive level of anxiety, poor motivation, misunderstanding of directions, and lack of rapport between examiner and child. While the present study sought to alleviate these problems, it is possible that some or all of these factors affected results of the auditory discrimination or reading testing.

Finally, the auditory discrimination test involved only phonological differences between English and Spanish. Differences in syntax, vocabulary, or intonation might prove to have a more powerful effect on reading achievement.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter is divided into the following three sections, each of which reviews an area of the literature pertinent to the study:

1. The phonological systems of English and Spanish

   A contrastive analysis of English and Spanish phonologies

   Divergent dialects of American Spanish

2. Auditory discrimination

   Auditory discrimination and socioeconomic status

   Auditory discrimination and reading

      Correlation studies

      Good versus poor reader studies

      Predictive studies

   Auditory discrimination problems of Spanish-speaking children

3. Standard English auditory discrimination and reading of non-standard English-speaking children.

English and Spanish Phonological Systems

Contrastive analysis involves a systematic comparison of two languages in order to predict and describe the

problems a speaker of one may have in learning the other. Among such factors as phonology, syntax, intonation, vocabulary, and orthography, the phonological differences between English and Spanish are considered by Cohen (cited in Fowler, 1967) to create the most difficulty for Spanish-speakers learning English. Following this approach, the analysis in this paper will be restricted to differences in the phonologies of English and Spanish which have been designated as learning problems for the Spanish-speaking child.

The sound system of an individual's native language operates through a system of automatic and semi-automatic habits after the first three or four years of life (Lado, 1957). Because these habits are so strong, the learner of a foreign language tends to transfer his native language phonemes and their variants into the new language. Distortions in both perception and production are produced by such interference. In other words, the learner "mispronounces" some phonemes of the target language because he "mishears" them.

Saville and Troike (1971) explain this phenomenon with the concept of the "phonemic filter." The phoneme system of the native language acts as a filter through which the learner hears the sounds of the target language. This "filter" assigns the sounds of the target language to

the nearest equivalent phoneme of the native language. For example, if the native language lacks the sound /θ/ (as in thin), the learner may fail to hear the new sound and instead may perceive it as the sound most phonetically similar in his native language, e.g., /t/, /s/, or /f/.

Before beginning the contrastive analysis, it is important to clarify the meaning of the term "phonemic difference." A phonemic difference signals a difference in meaning. The sounds /ey/ and /ɛ/ as in "bait" and "bet" signal a meaning difference in English. In Spanish, while both sounds exist phonetically, their occurrence is automatically determined by their position. The sound [ey] never occurs before /rr/; instead [ɛ] occurs. There are no words whose meaning depends on the use of [ey] and [ɛ] in Spanish. Hence, in Spanish there is no phonemic difference between these sounds; they are variants of the same phoneme /e/ (Capell, 1966).

A Contrastive Analysis of English and Spanish Phonologies

To predict problems of phonological interference, the first step is to compare the phonemes of English with the phonemes of Spanish to identify points of interference. The following analysis is largely adapted from Saville and Troike (1971). In this comparison of English and Spanish

phonemes, the symbols used (see Table 1) are an American modification of the International Phonetic Alphabet (Gleason, 1961).

Consonant Comparison

The 24 consonant phonemes of English are grouped, according to their manner of articulation, in the following manner:

1. Stops--sounds produced by a complete closing of the passage of air through the mouth.

2. Affricates--stop consonants released with a friction sound.

3. Fricatives or spirants--sounds produced by a constriction causing friction in the mouth but not completely closing the passage of air.

4. Nasals--produced with the stream of air flowing through the nasal passage.

5. Resonants--sounds produced without friction; /w/ and /y/ are often called semivowels or glides (Saville & Troike, 1971).

A comparison of the consonant phonemes of American English and American (non-Castilian) Spanish is shown in Table 2. Circled English phonemes are not phonemes in Spanish although they may occur phonetically. When the target language uses a phoneme absent from the native language, the learner may have difficulty hearing that phoneme and may substitute one of his native language

TABLE 1

PHONEME SYMBOLS USED IN THIS STUDY

Consonants

English

/b/ as in bed	/ŋ/ as in sing
/d/ as in do	/p/ as in pen
/č/ as in chair	/r/ as in row
/f/ as in for	/s/ as in so
/g/ as in go	/š/ as in share
/h/ as in hot	/t/ as in tie
/ǰ/ as in jump	/v/ as in very
/k/ as in cat	/w/ as in was
/l/ as in low	/y/ as in yes
/m/ as in man	/z/ as in zoo
/n/ as in no	/ž/ as in pleasure

Additional Spanish

/ñ/ as in mañana	/r̃/ as in perro
/ř/ as in pero	/x/ as in examinar

Vowels

English

/iy/ as in beat	/ə/ as in but
/I/ as in bit	/uw/ as in boot
/ey/ as in bait	/ʊ/ as in book
/ɛ/ as in bet	/ow/ as in boat
/ae/ as in bat	/ɔ/ as in bought
/a/ as in father	

Spanish

/a/ as in paso	/o/ as in poso
/e/ as in peso	/u/ as in puso
/i/ as in piso	

TABLE 2

COMPARISON OF CONSONANT PHONEMES OF ENGLISH AND SPANISH

	English						Spanish			
Voiceless stops	p		t		k		p	t		k
Voiced stops	b		d		g		b	d		g
Voiceless affricates				č					č	
Voiced affricates				(j)						
Voiceless fricatives	f	(θ)	s	(š)		h	f	s		x
Voiced fricatives	(v)	(ð)	(z)	(ž)						
Voiced nasals	m		n		(ŋ)		m	n	ñ	
Voiced resonants	w		l	y	r		w	l	y	ř
										r̃

Note.--Circled English phonemes are not phonemes in Spanish.

Source: M. R. Saville and R. C. Troike, A handbook of bilingual education, rev. ed. (Washington, D.C.: TESOL, 1971), p. 35.

phonemes (Lado, 1957). Therefore, Spanish-speakers could be expected to have difficulty differentiating between English phonemes absent from Spanish and their nearest phonemic equivalents. Expected consonant confusions include: /ǰ/ and /y/; /θ/ and /t/, /s/, or /f/; /š/ and /č/; /v/ and /b/; /ð/ and /d/; /z/ and /s/.

Generally, however, learning problems involve not the total absence of a phoneme in the native language but rather variants of phonemes (Lado, 1957). Several sounds which are separate phonemes in English occur in Spanish as members of the same phoneme. For example, Spanish /d/ has two variants: an initial [d] which resembles English /d̆/ and an intervocalic [ð] which is close to the English sound /ð/. Since their occurrence is automatically determined by position, the Spanish-speaker hears them as phonemically equivalent. Similarly [n] and [ŋ] are members of the same Spanish phoneme, but are phonemically distinct in English.

Vowel Comparison

Most varieties of American English have 11 distinct vowels as well as three diphthongs (vowels plus glides). These sounds are classified in three ways: (1) where they are produced in the mouth (high, mid, or low); (2) which part of the tongue is active in articulation (front, central, or back); and (3) whether the tongue

is tense or lax in their production. Tense vowels in English are usually diphthongized while the five Spanish vowels are relatively pure (Saville & Troike, 1971).

Figure 1 illustrates the classification of English vowels as set forth by Condon (1972).

In the following comparison of English and Spanish vowel phonemes shown in Table 3, the circled pairs of vowels are heard by Spanish-speakers as members of the same phoneme.

Spanish-speakers learning English must more than double the number of vowel distinctions they are used to making. The range of Spanish /i/ includes the vowel sounds in "mit" and "meat"; Spanish /e/ incorporates the medial sounds in "met" and "mate"; the vowel sounds in "coat" and "caught" are contained in Spanish /o/; the /u/ in Spanish takes in the vowel sounds in "pull" and "pool"; and Spanish /a/ covers a range including the medial sounds in "cut" and "cot" (Saville, 1970). This kind of problem, where variants of a single native language phoneme are distinct phonemes in the target language, is particularly difficult to overcome (Lado, 1957).

The English vowel sounds which cause the most problems for Spanish-speakers include /ə/ and /æ/, which are absent from Spanish. Other major difficulties arise with pairs of vowels which comprise only one sound in Spanish

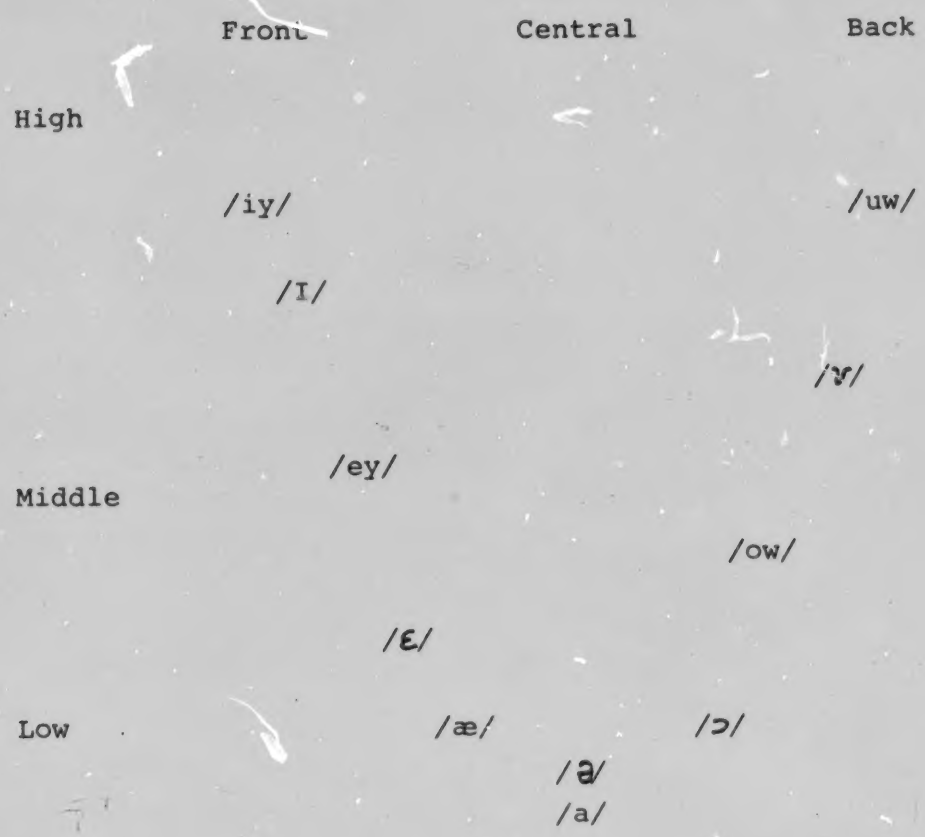

Fig. 1.--English vowels grouped by place of articulation.

TABLE 3

COMPARISON OF VOWEL PHONEMES OF ENGLISH AND SPANISH

English	Spanish
iy, I	i
uw, ʊ	u
	e
	o
ey, ɛ, æ	a
ə, a	
ow, ɔ	

Note.--Circled sets of vowels are heard by Spanish-speakers as members of the same phoneme.

Source: M. R. Saville and R. C. Troike, A handbook of bilingual education, rev. ed. (Washington, D.C.: TESOL, 1971), p. 35.

but in English differ in duration, i.e., /iy/ and /I/; /ʊ/ and /uw/. Vowel pairs which involve quality differences in English but not in Spanish also confuse the Spanish-speaking learner, i.e., /ey/ and /ɛ/; /ɔ/ and /ow/ (Condon, 1972).

The problems of phonemic differentiation presented above are summarized in Figure 2 (Saville & Troike, 1971).

Phonotactics

Spanish and English also differ in their phonotactics or distribution of phonemes. Most notably, Spanish permits very few final consonants and no final consonant clusters, while English has a large number of final consonants and clusters. Final b, d, k, s, and m cause particular problems for Spanish-speakers, who generally show poor discrimination of final consonants and final consonant clusters. Other difficult consonant positions include initial /st/, /sk/, and /sp/ which in Spanish cannot occur unless preceded by /e/; e.g., "escuela." Finally, Spanish-speakers are accustomed to pronouncing their medial [d] as /ð/ while their initial [d] resembles the English /d/ sound.

Some of the phonological problems which have been described have grammatical consequences as well (Condon, 1972; Labov, 1969; Saville & Troike, 1971). Difficulty hearing and producing final /s/ is related to plural and

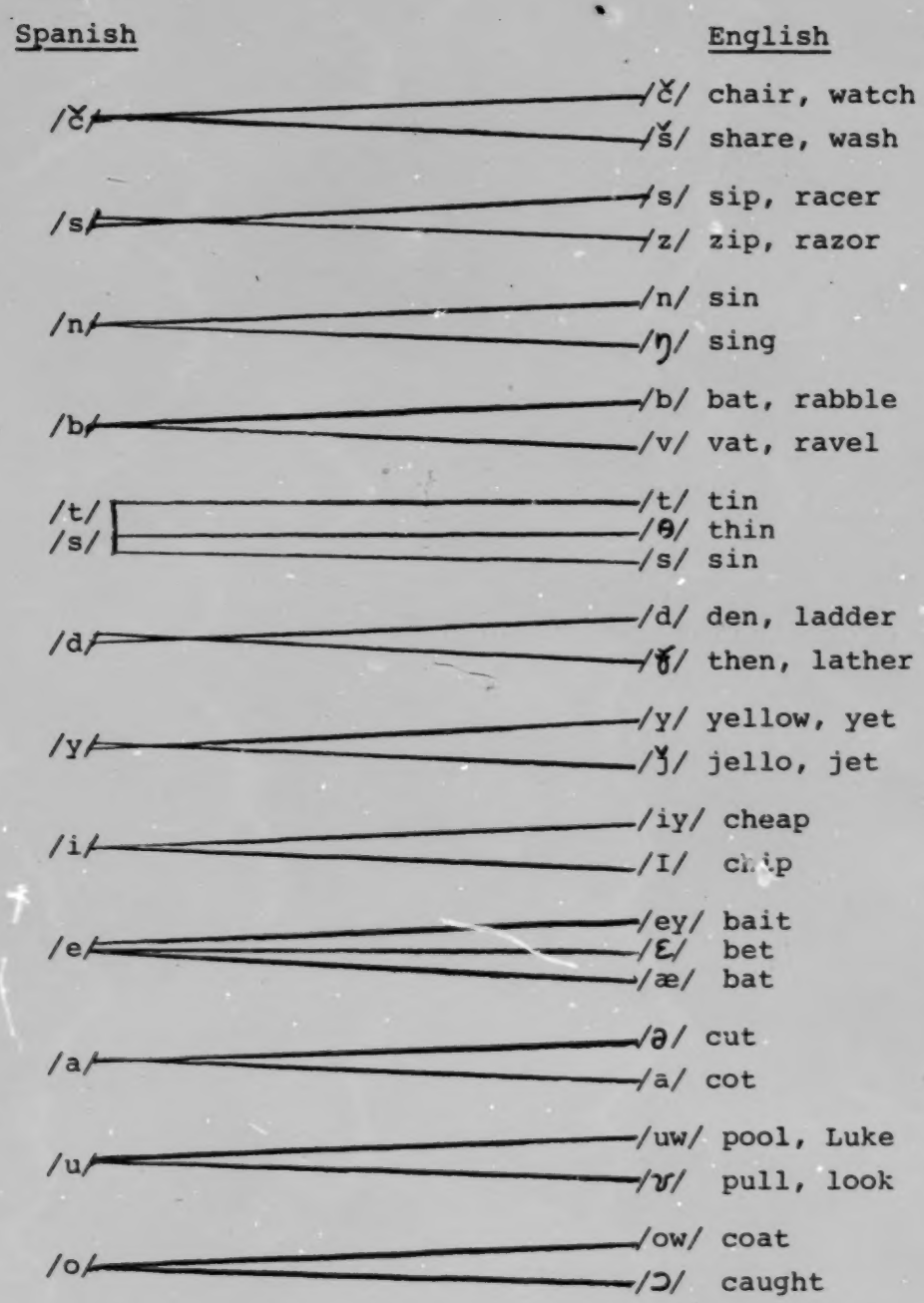

Fig. 2.--Summary of problems of phonemic differentiation for Spanish-speakers learning English.

Source: M. R. Saville and R. C. Troike, A handbook of bilingual education, rev. ed. (Washington, D.C.: TESOL, 1971), p. 38.

possessive noun suffixes and third person singular present verb suffixes. Problems with final /l/ could affect the use of future contracted forms. The loss of final /d/ is related to the past verb form, and general weakening of final consonants could disrupt the use of many forms of the verb "to be."

Labov (1969) contends that where large-scale phonological differences coincide with major grammatical differences, the resulting number of "nonstandard homonyms" could result in serious reading difficulty. Illustratively, a Spanish-speaker might hear and say each of the following words as /car/: card, cart, cars, Carl (Condon, 1972).

Divergent Dialects of American Spanish

While the label "Spanish-speaking" is widely used for convenience, its inaccuracy must be recognized. So-called "Spanish-speaking" children differ in several respects. Families of Spanish-speaking children in the United States may have come from Puerto Rica, Cuba, Mexico, Central or South America, or Spain. They may be recent arrivals or their ancestors may have immigrated generations ago. Different parts of the United States have developed regional Spanish dialects. Due to their proximity to Mexico, the Spanish of Mexican-Americans is

closer to standard American Spanish than the acculturated dialects of urban Puerto Ricans and Cubans. Depending on their socioeconomic status, Spanish-speaking children may have learned features of nonstandard dialects of English (Peña, 1970).

Another important differentiating factor is the degree of bilingualism of the Spanish-speaking child. Language skills of children labeled "Spanish-speaking" may vary from almost 100% Spanish to almost 100% English (Cornejo, 1969). In a pilot study of the lexicon of 24 five-year-old Mexican-American children, Cornejo determined that they were better able to express themselves in English than in Spanish. Interference from Spanish to English was found to be highly significant at the phonological level, but minor at the lexical and grammatical levels. Some of the most significant phonological features of the children's speech included: reduction of consonant clusters, shifting of primary stress, devoicing of consonants, and phonemic alteration (/θ/ to /t/, /ð/ to /d/, and mixed use of /č/ and /š/).

Comparing the oral variations of first-, second-, and third-graders, Bussey (1971) detected these substitution problems in the speech of the Mexican-American students: /č/ for /š/, /š/ for /č/, /s/ for /z/, /iy/ for /I/, /I/ for /a/.

After three months of public school, Mexican-American children in Jameson's (1967) study showed the following difficulties in reproduction of English stimuli: /v/, /č/ and /š/, and a substantial number of final consonants and consonant clusters. The children did not have the expected confusion between /ð/ and /d/ and had much less difficulty with English vowels than had been predicted from contrastive analysis.

Relatively little research has been done on the dialect of English spoken by Spanish-speaking Puerto Rican children. A pilot study by Williams (1972) sought to determine the range of errors in spontaneous speech made by several Puerto Rican children of intermediate English ability. Most conspicuous and frequent of the vowel errors was the substitution of /a/ for /ə/ and /æ/. The most pervasive consonant error was word-and-syllable final cluster simplification, including total omission of final consonants. None of the children had the expected difficulty with initial /sk/. Williams suggested that Puerto Rican Spanish-speakers often omit the /e/ phoneme which precedes all /sk/ clusters in Spanish.

Significant differences in dialect articulation have been found to exist between segregated Puerto Rican students and those integrated with black students (Reinstein & Hoffman, 1972).

Sardy (1969) provided a summary of Puerto Rican Spanish-English phoneme confusions listed in a New York City Board of Education curriculum guide (Table 4).

Auditory Discrimination

Auditory discrimination has been defined as the capacity to distinguish between phonemes used in speech (Wepman, 1960). This basic language skill is generally considered essential for the development of proper articulation. Its importance in learning to read is more controversial. In this section auditory discrimination will be discussed in relation to socioeconomic status, to reading, and to the dialect of Spanish-speaking Puerto Rican children.

Auditory Discrimination and Socioeconomic Status

The positive relationship between socioeconomic status and auditory discrimination is widely accepted. Theorists attempting to explain this relationship are divided into two factions, "deficit" theorists and "difference" theorists. Such researchers as Clark and Richards (1966) and Deutsch (1967), using auditory discrimination tests with standard English stimuli, have concluded that the auditory perception of disadvantaged children is deficient. Noise level in the home and poor motivation are among the factors cited as causes of this deficiency.

TABLE 4

FOURTEEN PUERTO RICAN SPANISH-ENGLISH PHONEME CONFUSIONS

Consonant sounds	Vowel sounds
1. /ǰ/ jest and /č/ chest	10. /ə/ done and /ɔ/ dawn
2. /ð/ they and /d/ day	11. /ey/ late and /ɛ/ let
3. /z/ zinc and /s/ sink	12. /æ/ hat and /a/ hot
4. /b/ bat and /p/ pat	13. /ʊ/ pull and /uw/ pool
5. /v/ vote and /b/ boat	14. /ow/ coal and /ɔ/ call
6. /d/ den and /t/ ten	
7. /n/ thin and /ŋ/ thing	
8. /m/ comb and /n/ cone	
9. /g/ gave and /k/ cave	

Source: J. Sardy, Dialect, auditory discrimination, and phonics skills (unpublished doctoral dissertation, Yeshiva University, 1969), p. 36.

Advocates of the "difference" position (Adler, 1972; Baratz, 1969) contend that the performance of disadvantaged children on standard English discrimination tasks reflects not a deficiency but the child's successful mastery of the sound system of his own dialect. Sardy (1969), in a study of fourth-grade Puerto Rican, black, and white lower-class and middle-class students, found no significant relationship between socioeconomic status and auditory discrimination. However, ethnolinguistic group membership was significantly related to the auditory discrimination test score.

Several theorists have proposed that both linguistic and social factors affect auditory discrimination. Entwisle (1971) noted that "the ability to make certain auditory discriminations apparently depends on the kinds of discriminations one is used to making that are important for signalling meanings [p. 6-111]," but also suggested possible differences in an attentional or set factor. A similar dual explanation has been advanced by Fowler (1967).

Recent research by Arnold and Wist (1970) investigated the auditory discrimination abilities of disadvantaged Mexican-American and Anglo-American children in the primary grades. The Mexican-American children made a significantly greater number of errors than did the

Anglo-American children, particularly on those items predicted to be difficult through contrastive analysis.

Auditory Discrimination and Reading

Samuels (1971) noted that "there are few areas in psychology which present as tangled a web, as many conflicting points of view, and conflicting evidence, or as much naïveté in the research, as the relationship of auditory discrimination to reading [p. 7-91]."

Many researchers and theorists have pointed out the logical relationship between auditory discrimination and reading, and particularly between auditory discrimination and phonics (Arnold & Wist, 1970; Deutsch, 1967; Durrell & Murphy, 1953; Entwisle, 1971; Robinson, 1966). As Sardy (1969) put it:

> The relationship between auditory discrimination and phonics would appear to be obvious. A child should be able to perceive differences between speech sounds before he can learn to identify the symbolic representations of the sounds as they appear in print and to interpret these symbols into oral language [p. 9].

The results of actual research regarding auditory discrimination and reading have been mixed. Following the classification of Dykstra (1966), three general types of studies have been performed: (1) correlation studies which assess auditory discrimination and reading simultaneously, (2) comparisons of the auditory discrimination of good and poor readers, and (3) predictive studies which

determine relationships between auditory discrimination test scores at the beginning of first grade and reading achievement at the end of first grade or in subsequent grades.

Correlation Studies

The Wepman Auditory Discrimination Test is composed of pairs of words containing minimal phonemic differences. Identical pairs of words are interspersed among the minimal pairs as a check on internal validity. The subject listens to each word pair and then responds with his judgment of "same" or "different." Wepman (1960), presenting data from several studies using this test, reported finding a significant relationship between poor articulation and poor discrimination and a lower but significant relationship between poor discrimination and poor reading. A low positive relationship was also found between intelligence test scores and auditory discrimination scores. Wepman contended that many children entering school have not yet developed adequate auditory discrimination.

Dykstra (1966) summarized the findings of several correlation studies, finding that results varied with different populations. Disabled reader studies indicated marked deficiencies in auditory discrimination skills, while results for unselected elementary and secondary

populations were inconclusive. Age did not appear to be a factor in determining a relationship in grades 2 to 12.

Good Versus Poor Reader Studies

According to Dykstra (1966), comparisons of the discrimination skills of good and poor readers have generally yielded a significant relationship between reading and auditory discrimination.

Bond's early study in 1935 discovered significant differences in the auditory discrimination abilities of good and poor readers taught with a phonics approach (cited in Wist, 1968).

Investigating the relationship of auditory and visual functioning to the reading achievement of lower-class black male children, Katz and Deutsch (1967) employed a taped presentation of "familiar" (standard English) and "unfamiliar" (Hebrew) stimuli as a test of auditory discrimination. Good readers exhibited better discrimination than poor readers, especially at the youngest (second-grade) level.

In a similar study, Deutsch (1967) used the Wepman Test of Auditory Discrimination to assess the discrimination abilities of lower-class children. The test differentiated between "good" and "poor" readers (the high and low thirds of each grade tested) at the .001 level of confidence.

Predictive Studies

Robinson (1972) compared the reading progress through third grade of pupils whose auditory and visual perception abilities were tested upon entry to first grade. She found that "auditory discrimination had a strongly significant effect on reading scores regardless of the method [phonics or sight] used for teaching. The effects were evident at both first- and third-grade levels and on all tests [p. 33]."

Auditory blending ability has been defined as the ability to reproduce a word by synthesizing its component parts, thus involving the factor of auditory discrimination (Chall, Roswell, & Blumenthal, 1963). In a study of first-grade black New York City children, Chall et al. found a significant relationship between first-grade auditory blending ability and third-grade silent reading skills. With I.Q. held constant, the correlation was .64, as high as the relationship between first-grade I.Q. and third-grade reading achievement.

Relationships between pre-reading measures of auditory discrimination and first-grade reading achievement were investigated in Dykstra's (1966) study. Auditory discrimination was assessed with seven separate subtests from published reading readiness tests. Intercorrelations among these seven measures were consistently low, rarely

above .40, suggesting that different skills may have been measured by the tests. Correlations with reading measures ranged from .00 to .46. Scores on the measures showed a moderate relationship to intelligence and a negligible relationship to chronological age. Variation in the performance on the auditory discrimination and intelligence tests together accounted for less than 40% of the variability in reading.

Dykstra's research results coincided with his general finding that predictive studies have shown small positive correlational relationships.

In a highly critical review of auditory discrimination research, Samuels (1971) asserted that uncontrolled task variables and procedural shortcomings may have invalidated the results of many such studies. In particular, he stressed the need for repeated testing of young children in order to obtain a true measure of their auditory abilities. Samuels reported recent research indicating that phonological test scores were significantly better on later days of testing than on the first day. Further, Samuels suggested that the requirement of making same-different judgments about minimal pairs is too difficult for many young children without prior training. Moreover, he questioned concentrating on auditory discrimination as a source of reading difficulty for dialectally different

groups, as differences in attention, motivation, and cognition may be more important causes of reading problems. Finally, Samuels concluded: "For most children to read, the English language, its phonology, and its syntax have been mastered. Thus, when a letter sound, or a word, is presented, in most cases he can discriminate it [p. 7-102]." It should be noted, however, that for the child raised in a Spanish-speaking environment, English phonology has normally not been mastered by the time the child enters school.

Auditory Discrimination Problems of Spanish-Speaking Children

A test of the auditory discrimination ability of Spanish-speaking primary grade Mexican-American children has been devised by Wist (1968). The items in Table 5 proved difficult for Wist's pilot test subjects. Wist found that her disadvantaged Anglo-American subjects scored significantly higher than her disadvantaged Mexican-American subjects.

In Sardy's (1969) pilot study of the auditory discrimination of fourth-graders in New York City, the following phoneme contrasts were difficult for the Puerto Rican children (Table 6). None of the vowel contrasts predicted to be difficult were in fact problems for the Puerto Rican subjects.

TABLE 5

DIFFICULT ITEMS IN WIST'S PILOT STUDY

Initial	Medial	Final
/sk/, /s/	/ɛ/, /I/	/s/, /z/
/č/, /š/	/uw/, /ʊ/	/b/, /v/
/b/, /v/		/rk/, /r/
/s/, /z/		/n/, /ŋ/
		/v/, /f/
		/š/, /č/
		/t/, /k/
		/d/, /t/
		/s/, /sp/
		/sk/, /s/
		/vd/, /v/
		/b/, /p/
		/s/
		/k/, /g/

Source: H. Wist, Auditory discrimination abilities of disadvantaged children in the primary grades (unpublished master's thesis, University of Texas, 1968), p. 69.

TABLE 6

DIFFICULT PHONEME CONTRASTS IN SARDY'S STUDY

Initial	Medial	Final
/d/, /t/		/lt/, /l/
/ð/, /d/		/ld/, /l/
/z/, /s/		/n/, /nd/
/ǰ/, /č/		/m/, /md/
/b/, /v/		/ks/, /kst/
/s/, /θ/		/b/, /bd/
/d/, /ð/		/bd/, /b/
		/f/, /ft/
		/ø/, /l/
		/zd/, /z/
		/md/, /m/

Source: J. Sardy, Dialect, auditory discrimination, and phonics skills (unpublished doctoral dissertation, Yeshiva University, 1969), p. 72.

Standard English Auditory Discrimination and Reading of Non-Standard English-Speaking Children

Relationships among dialect pronunciation, auditory discrimination, and the reading achievement of lower-class black fourth-graders were investigated by Gross (1967). His findings included a high association between type of articulation error and type of discrimination error. No significant relationship was found between auditory discrimination and reading achievement. Gross suggested that with a younger population the correlation might have been significantly high.

Fowler (1967) evaluated the effectiveness of the Brengelman-Manning Linguistic Capacity Index as a predictor of first-grade reading achievement of Mexican-American children. The contrastive phonology scale of the Index assesses auditory discrimination of selected phoneme pairs, while the other two scales are concerned with syntax and vocabulary. Fowler found that by adding the Index scores to I.Q. scores, predictive efficiency was improved and that the Index administered in autumn was as effective a predictor as a standardized readiness test given in January.

Finally, in Sardy's (1969) study of dialect, auditory discrimination, and phonics skills of fourth-grade black, white, and Puerto Rican lower-class and middle-class

fourth-graders, the ability to discriminate between standard English minimal pairs was not sufficient to account for performance on a decoding phonics test. (Decoding phonics skill was defined as the ability to recognize the written representation of a sound heard in a nonsense word environment.) Ethnolinguistic group membership related significantly with the auditory discrimination test scores, with Puerto Rican children showing the greatest general difficulty. However, Sardy concluded that she had not isolated any "Negro," "Puerto Rican," or "standard" patterns of auditory discrimination.

Summary

In this chapter several areas pertinent to the present study were investigated. Through contrastive analysis, the most important phonological differences between English and Spanish were presented. Idiosyncratic features of American Spanish dialects were described.

Auditory discrimination was discussed in relation to socioeconomic status, reading, and the dialect of Spanish-speaking Puerto Rican children. Most research indicates that poor children have difficulty with standard English auditory discrimination. Linguistic differences appear to account for at least some of this difficulty. The relationship of auditory discrimination to reading is more controversial; the skill appears to be more important

in early reading than in reading in the intermediate grades. Specific auditory discrimination problems of Spanish-speaking children were described.

Finally, studies exploring the interrelationships between linguistic differences, auditory discrimination, and reading were presented.

No study was found which assessed the auditory discrimination abilities of Puerto Rican first-graders in relation to their first-grade reading achievement.

CHAPTER III

PROCEDURE

In this investigation an experimental auditory discrimination test was developed for Puerto Rican Spanish-speaking first-grade students. After a pilot study, the test was revised and administered to 52 subjects. Test results were analyzed and then correlated with scores on the Gates-MacGinitie Reading Test, Primary A, Form 1 (Appendix D). This chapter consists of a detailed explanation of the development of the experimental test, the pilot study, the test revision, the main study, and the statistical treatment of the data for significance.

Development of the Auditory Discrimination Test

An experimental auditory discrimination test was developed for use in this investigation. First a pilot test (Appendix E) was devised, based on the contrastive analyses of Condon (1972), Lado (1957), Saville and Troike (1971), as well as research by Sardy (1969), Williams (1972), and Wist (1968). The pilot test was composed of 47 pairs of words containing minimal phonemic differences predicted to be difficult for Spanish-speakers

to discriminate. Eight pairs of identical words were also included as an internal validity check (Wepman, 1960).

Phonemic contrasts represented by the pilot test items, as well as the source of each contrast, are shown in Table 7. Items preceded by an asterisk have been designated by contrastive analyses or demonstrated by research to be particularly difficult for Puerto Rican Spanish-speakers. Since there was substantial overlap among the phonemic contrast lists from the various sources, each contrast is credited to only one source.

The pilot test was tape-recorded in order to provide a standardized presentation of the items to each S. Items were read onto a Sony UHF C-90 Cassette on a Craig 2610 Cassette Recorder by a former radio actress chosen for clear diction and lack of a regional accent. Each pair of words was repeated twice consecutively onto the tape, separated by a two-second pause; the second repetition was followed by a five-second pause for oral student response.

The pilot auditory discrimination test was individually administered by the writer in April 1973 to six kindergarten children and four first-grade children meeting the following criteria:

1. No known speech or hearing defects.
2. From a home in which Spanish is spoken. This

TABLE 7

PHONEMIC CONTRASTS REPRESENTED BY ITEMS ON THE EXPERIMENTAL AUDITORY DISCRIMINATION TEST

Source of phonemic contrast	Position of phonemic contrast					
	Initial contrasts		Medial or vowel contrasts		Final contrasts	
	Form I	Form II	Form I	Form II	Form I	Form II
"Puerto Rican Phoneme Confusions" in New York City Board of Education Teachers Guide	*/g/-/k/ */ð/-/d/ */b/-/v/	*/d/-/t/ */ǰ/-/č/ */b/-/p/ */b/-/p/ */m/-/n/	*/ɝ/-/uw/ */ow/-/ɔ/ */ɛ/-/æ/	*/ey/-/ɛ/ */æ/ -/a/ */ə/-/ɔ/	*/g/-/k/ */n/-/ŋ/ */p/-/b/	*/d/-/t/ */z/-/s/ */m/-/n/
Lado's contrastive analysis	/č/-/š/ /v/-/f/				/sk/-/s/ /č/-/š/	
Condon's contrastive analysis					/v/-/vd/ /t/-/k/ /r/-/rz/	/rk/-/r/ /v/-/f/
Saville & Troike's contrastive analysis	/sm/-/m/ /sk/-/s/					
Williams' study			*/ə/-/a/			

(continued)

TABLE 7 (continued)

Source of phonemic contrast	Position of phonemic contrast					
	Initial contrasts		Medial or vowel contrasts		Final contrasts	
	Form I	Form II	Form I	Form II	Form I	Form II
Sardy's study	*/s/-/θ/				*/zd/-/z/ */bd/-/b/ */ow/- /owl/	*/fd/-/f/ */x/-/xd/ */m/-/md/ */lt/-/t/ */s/-/sp/ */n/-/nd/
Wist & Arnold's study			/ɛ/-/I/			

*Items preceded by an asterisk have been designated or demonstrated to be particularly difficult for Puerto Rican Spanish-speakers.

was operationally defined as giving at least one affirmative answer to the questions asked in the Informal Interview (Appendix A).

3. Born in Puerto Rico or having at least one native Puerto Rican parent.

4. Able to complete successfully the Standardized Pretraining Session in either English or Spanish (Appendix C).

Each child listened to each minimal pair repeated twice on the tape and then orally gave his judgment that the two words were the "same" or "different" (or "same" and "not the same").

The major finding of the pilot study was that the pilot test was too long for young children. To avoid the undercutting of reliability by fatigue, it was necessary to shorten the test. Because each item represented a separate phonemic difference, it was not possible to eliminate any of the test items. Consequently, the test was reduced to two shorter tests.

To accomplish this goal, items were first divided into four categories: (1) initial phonemic contrasts (e.g., bat-vat); (2) medial or vowel phonemic contrasts (e.g., pat-pot); (3) final phonemic contrasts (e.g., bat-back); and (4) "same" items included as an internal validity check (e.g., go-go). Items within each of the first

three categories were randomly assigned to either Form I or Form II of the final experimental auditory discrimination test. Then items assigned to each form were combined in random order. Finally, five of the "same" items were distributed identically throughout both forms. The two final forms (Appendix F) were recorded by the same reader using the same equipment and timing specifications as the pilot test.

Reliability of the two auditory discrimination forms was established in the main study by means of a test-retest procedure. Fifty-two Puerto Rican Ss (32 female and 20 male) were randomly assigned to take either Form I or Form II. Of these Ss, 28 were randomly chosen to be retested on the same form as much later as the testing schedule and the schools involved would allow, usually one to two days.

Since the experimental auditory discrimination test does not measure at the interval level and because a normal distribution of auditory discrimination ability could not be assumed for the S population, a nonparametric measure of correlation, the Spearman rank correlation coefficient, or r_s (Siegel, 1956) was used to evaluate test-retest reliability. The r_s of Form I was found to be .92; the r_s of Form II was determined to be .94. It was therefore concluded that both forms demonstrated

satisfactory levels of reliability.

Evidence for the validity of the auditory discrimination test was found in the following factors:

1. The test format was patterned after the format of the Wepman Test of Auditory Discrimination, including the addition of "same" items as an internal validity check (Wepman, 1960).

2. Test items were selected from contrastive analyses and research results.

3. All items expected to be difficult for Spanish-speakers were included in the pilot test, then randomly divided between Forms I and II.

Subjects

The Ss in this investigation were 32 female and 20 male Puerto Rican Spanish-speaking first-grade students. All Ss attended one of six Trenton, New Jersey, elementary schools selected because of their relatively high concentrations of Spanish-speaking students. Another reason for choosing these six schools was that at least 50% of the total student body at each school qualified for a free lunch under the Federal Lunch Program (Appendix B). This fact was taken as sufficient indication, for the purposes of this study, that the Ss resided in a low-income area. Sociolinguistic information regarding the six schools was provided by the school principals and is summarized in

Table 8.

Selection of the Ss was made from a list of all Spanish-surnamed students in the six schools who met the same criteria as required of the pilot study population.

Instruments

Instruments employed in this investigation were the two forms of the experimental auditory discrimination test and Form 1 of the Gates-MacGinitie Reading Test, Primary A, which is regularly administered to Trenton first-grade students each spring. The reliability and validity of the auditory discrimination test have been discussed in an earlier section of this paper.

The Gates-MacGinitie Reading Test, Primary A, Form 1, consists of two subtests of vocabulary and comprehension. According to the Technical Manual (Gates & MacGinitie, 1965), the alternate form reliability of the vocabulary subtest is .86, while the alternate form reliability of the comprehension subtest is .83. Individual test items were chosen from a set of pretest items through computation of difficulty and discrimination indices.

Procedure

In mid-March 1974 the writer began the administration of the experimental auditory discrimination tests in individual sessions with the Ss. Since the standardized

TABLE 8

TOTAL NUMBER OF STUDENTS, PERCENTAGE OF SPANISH-SPEAKING STUDENTS, AND PERCENTAGE OF STUDENTS RECEIVING A FREE FEDERAL LUNCH IN THE SIX SCHOOLS IN THE STUDY

School	Number of students in each school	Percentage of Spanish-speaking students	Percentage of students with free lunch
A	375	35	50
B	928	15	89
C	709	27	90
D	600	15	85
E	500	8-10	80-90
F	770	8	50

Data obtained from school records.

reading test (Gates-MacGinitie Reading Test, Primary A, Form 1) was scheduled by the school system for mid-May and a two-week Easter vacation was scheduled during April, it was necessary to begin testing in March.

A total of 78 children was seen individually by the writer, and all were given the Informal Interview (Appendix A). The Interview served several functions: it acted as a basis for getting acquainted with each child and trying to put him at ease; it verified that at least some Spanish was spoken in the home; and it indicated the child's ability to converse in English. If any S seemed uncomfortable in English, he was offered the chance to converse in Spanish. Only five Ss chose to do so. All potential Ss were also given the Standardized Pretraining Session (see Appendix C) in which it was determined if they could tell whether two large Fisher-Price plastic beads were the same or different, whether they could differentiate between two different words, and finally whether they could discriminate minimal pairs with phonemic differences not expected to be difficult for Spanish-speakers. Of the 78 children seen, nine children were disqualified as Ss because they were unable to complete successfully the Standardized Pretraining Session and 17 children were eliminated because they missed at least one "same" item on the auditory discrimination test. Therefore,

a total of 52 Ss, randomly assigned to take either Form I or Form II of the test, was able to complete the pre-training and take the test.

In mid-May the school system provided for the testing of all of its first-grade students on the Gates-MacGinitie Reading Test, Primary A, Form 1. Of the 52 Ss whose auditory discrimination was tested in March, 44 were tested on the standardized reading test.

Data Analysis

Preceding the main study, a .05 level of significance was specified for analysis of the data.

In order to find the relationship between scores on the two auditory discrimination test forms and scores on the Gates-MacGinitie Reading Test, Primary A, Form 1, Spearman rank correlation coefficients (Siegel, 1956) were computed. Forms I and II were not combined for these analyses since every item on each form measures a separate phonemic contrast. As explained earlier, a nonparametric measure of correlation was applied to the data because the requirements for use of parametric measures could not be met.

Six separate Spearman rank correlation coefficients were computed:

1. Scores on Auditory Discrimination Test, Form I, and Gates-MacGinitie composite reading scores.

2. Scores on Auditory Discrimination Test, Form II, and Gates-MacGinitie composite reading scores.

3. Scores on Auditory Discrimination Test, Form I, and Gates-MacGinitie vocabulary subtest scores.

4. Scores on Auditory Discrimination Test, Form II, and Gates-MacGinitie vocabulary subtest scores.

5. Scores on Auditory Discrimination Test, Form I, and Gates-MacGinitie comprehension subtest scores.

6. Scores on Auditory Discrimination Test, Form II, and Gates-MacGinitie comprehension subtest scores.

Chi-square analyses (Tuckman, 1972) were used to analyze the errors on the auditory discrimination test in order to determine: (1) if there was a significant difference between errors on test items designated as particularly difficult for Puerto Rican Spanish-speakers and errors on items expected to be difficult for Spanish-speakers in general; and (2) if there was a significant difference between errors on items with initial phonemic contrasts, medial or vowel phonemic contrasts, or final phonemic contrasts.

Summary

A pilot auditory discrimination test, consisting of 47 word pairs with phonemic contrasts expected to be difficult for Spanish speakers to discriminate as well as eight pairs of identical words, was administered in April

1973, to 10 Spanish-speaking Puerto Rican children. As a result of the pilot study, the test was reduced to two shorter forms. In March 1974, 52 children were individually tested on one of the two auditory discrimination test forms and 28 children were retested to assess the reliability of the two forms. The test scores were correlated with scores on the Gates-MacGinitie Reading Test, Primary A, Form 1, administered in May 1974 by the school system.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this investigation was to explore the relationship between auditory discrimination and reading for Puerto Rican Spanish-speaking first-grade children. In mid-March 1974, 52 Ss were tested on an experimental auditory discrimination test. Of these Ss, 44 were subsequently given the Gates-MacGinitie Reading Test, Primary A, Form 1. In this chapter, the relationships between these sets of scores will be presented and discussed. Further, errors on the auditory discrimination test will be analyzed to determine types and patterns.

Results

The first six hypotheses predicted that there would be no significant correlation between the scores of 44 Ss on:

1. Auditory discrimination test, Form I, and composite scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

2. Auditory discrimination test, Form II, and composite scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

3. Auditory discrimination test, Form I, and vocabulary subtest scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

4. Auditory discrimination test, Form II, and vocabulary subtest scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

5. Auditory discrimination test, Form I, and comprehension subtest scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

6. Auditory discrimination test, Form II, and comprehension subtest scores on the Gates-MacGinitie Reading Test, Primary A, Form 1.

Spearman rank correlation coefficients were computed for each pair of variables. As can be seen from the summary of these data in Table 9, modest positive correlations were found between all pairs of variables with the exception of auditory discrimination Form I and comprehension subtest scores, which exhibited a very low positive relationship. Correlations between variable pairs 1, 2, 3, 4, and 6 were significant at the .05 level. On the basis of these data, null hypotheses 1, 2, 3, 4, and 6 must be rejected. However, null hypothesis 5 cannot be rejected.

Hypotheses 7 and 8 dealt directly with analysis of errors on the auditory discrimination tests. For the

TABLE 9

SPEARMAN RANK CORRELATION COEFFICIENTS FOR AUDITORY DISCRIMINATION SCORES AND READING TEST SCORES

Hypothesis	Gates-MacGinitie Reading Test, Primary A, score	Auditory discrimination score	Spearman rank correlation coefficient
1	Composite	I	.414*
2	Composite	II	.471*
3	Vocabulary	I	.497*
4	Vocabulary	II	.513*
5	Comprehension	I	.183
6	Comprehension	II	.517*

*These items are significant at the .05 level.

purpose of this analysis, Forms I and II were combined. Hypothesis 7 stated that there would be no significant difference between errors on the 30 items designated particularly difficult for Puerto Rican Spanish-speakers (PRD items) and the remaining 17 items expected to be difficult for Spanish-speakers in general (SSD items). Of the 676 total errors made by the 26 Ss who took Form I and the 26 Ss who took Form II, PRD items accounted for 436 of the errors, as shown in Table 10. To determine if there was a significant difference between PRD errors and SSD errors, a chi-square analysis was done.

A chi-square value of .012 indicated no significant difference between errors on the two types of items. Accordingly, the null hypothesis could not be rejected. Items which had been predicted from contrastive analysis and prior research to be particular problems for Puerto Rican Spanish-speakers were no more difficult for these Ss than other items expected to be difficult for all Spanish-speakers.

The final hypothesis stated that there would be no significant difference among errors on items with initial phonemic contrasts, items with medial or vowel phonemic contrasts, and items with final phonemic contrasts. Of the 47 total items on Forms I and II, 15 items contrasted in the initial position, 9 items had medial or vowel

TABLE 10

BREAKDOWN OF TOTAL AUDITORY DISCRIMINATION TEST ERRORS INTO ERRORS ON PRD* ITEMS AND ERRORS ON SSD** ITEMS

	Total errors	PRD errors*	SSD errors**
Form I	366	200	166
Form II	310	236	74
Combined Forms I and II	676	436	240

Chi-square value was .012, not significant at the .05 level.

*PRD items were designated particularly difficult for Puerto-Rican Spanish-speakers.

**SSD items were expected to be difficult for Spanish-speakers generally.

contrasts, and 23 items had final contrasts. Analysis of the errors on both Forms I and II reveals 183 errors on items with initial contrasts, 102 errors on items with medial or vowel contrasts, and 391 errors on items with final contrasts, as shown in Table 11. To determine if there was a significant difference among these types of errors, a chi-square analysis was performed. The chi-square value was 7.32, significant at the .05 level. Therefore, null hypothesis 8 was rejected.

Further analysis of test errors indicates that the only error position having more above-median numbers of errors than at-or-below median numbers of errors is the final phonemic contrast position. Reference to Table 12 verifies that the final contrast position was the most difficult for this S population.

Auditory discrimination test items with an above-median number of error responses are shown in Table 13.

Discussion

The major finding of this investigation was a modest positive relationship between scores on the experimental auditory discrimination test Forms I and II and scores on the Gates-MacGinitie Reading Test, Primary A, Form 1. Positive correlations between scores on both auditory discrimination forms and composite reading scores, scores on both auditory discrimination forms and vocabulary subtest

TABLE 11

TOTAL NUMBER OF RESPONSES AND ERROR RESPONSES ON AUDITORY DISCRIMINATION TEST ITEMS WITH INITIAL, MEDIAL, AND FINAL CONTRASTS

	Errors	Total responses
Initial contrast items	183	390
Medial or vowel contrast items	102	234
Final contrast items	391	598
All items combined	676	1222

TABLE 12

ABOVE AND AT-OR-BELOW MEDIAN ERRORS FOR INITIAL, MEDIAL OR VOWEL, AND FINAL CONTRAST ITEMS ON AUDITORY DISCRIMINATION TEST

	Initial contrast items	Medial or vowel contrast items	Final contrast items
Above-median number of errors	5	3	15
At-or-below median number of errors	10	5	9

TABLE 13

AUDITORY DISCRIMINATION TEST ITEMS WITH ABOVE-MEDIAN NUMBER OF ERROR RESPONSES

	Form I	Form II
Items with initial contrasts	chair-share (/č/-/š/)	sip-zip (/s/-/z/)
	there-dare (/ð/-/d/)	me-knee (/m/-/n/)
	bat-vat (/b/-/v/)	
Items with medial or vowel contrasts	full-fool (/ʊ/-/uw/)	
	pen-pan (/ɛ/-/æ/)	
	pup-pop (/ə/-/a/)	
Items with final contrasts	saved-save (/vd/-/v/)	laughed-laugh (/fd/-/f/)
	closed-close (/zd/-/z/)	mix-mixed (/x/-/xd/)
	mask-mass (/sk/-/s/)	slam-slammed (/m/-/md/)
	sin-sing (/n/-/ŋ/)	lose-loose (/z/-/s/)
	car-cars (/r/-/rz/)	win-wind (/n/-/nd/)
	witch-wish (/č/-/š/)	them-then (/m/-/n/)
	so-soul (/ow/-/owl/)	grass-grasp (/s/-/sp/)
		leave-leaf (/v/-/f/)

scores, and scores on Form II of the auditory discrimination test and comprehension subtest scores were significant at the .05 level. The very low positive correlation between scores on Form I of the auditory discrimination test and the comprehension subtest did not attain statistical significance. No reason can be given for this discrepant finding.

Results are in keeping with the findings of Wepman (1960) who found a significant relationship between poor articulation and poor discrimination, and a lower but still significant relationship between poor discrimination and poor reading. Gross (1967) found a low positive, but not significant, relationship between auditory discrimination and reading achievement for lower-class black fourth-grade students. In a summary of studies of auditory discrimination and reading, Dykstra (1966) found that the results of correlation studies were inconclusive, while predictive and good vs. poor reader studies generally yielded low positive relationships between auditory discrimination and reading. The findings of the present investigation do not support the strong (predictive) relationship which Robinson (1972) found between auditory discrimination and reading.

While a low significant relationship between auditory discrimination and reading is not inconsistent with the results of previous studies, it had been anticipated

that the relationship would have been stronger for a non-native English-speaking population. A number of factors may have been responsible for the lower-than-expected correlation. The fairly stringent requirements of completion of the Standardized Pretraining Session and correct responses on all "same" items on the test itself, which disqualified fully one-third of the potential S population, may have resulted in an unrepresentative sample of the Ss in terms of auditory discrimination and possibly intelligence and reading ability. This supposition is further supported by the fact that half of the Ss according to their Gates-MacGinitie grade level score were reading at or above grade level, while the other half were reading only slightly below grade level, contrary to the low reading levels characteristic of inner-city linguistically different children.

The testing schedule, which necessarily involved a nearly two-month gap between auditory discrimination testing and reading achievement testing, may have allowed for interference from external variables including differences in classroom learning experiences.

Other complications may have arisen from the auditory discrimination test instrument. Perhaps the making of same-different judgments of isolated minimal pairs, especially from a tape-recording with, therefore, no

visual cues, is a task too remote from the discrimination skills required in the first-grade classroom. It might also be the case that a stronger correlation between auditory discrimination and reading scores would have been found if the auditory discrimination score had represented the Ss' responses on all 47 minimal pairs.

The Gates-MacGinitie Reading Test, Primary A, Form 1, consists of subtests of vocabulary and comprehension skills but does not evaluate phonics skills. Since auditory discrimination ability is logically closest to the decoding aspects of reading, a higher relationship might have been found if the standardized reading test had included a phonics subtest.

A breakdown of the errors on the auditory discrimination test revealed some interesting deviations from the predictions of contrastive analysis and research. Items specifically designated by contrastive analyses and prior studies as particularly difficult for Puerto Rican Spanish-speakers were no more difficult for this S population than the other items on the test. This may be indicative of greater variability among inner-city Puerto Rican speech patterns than would be anticipated from contrastive analysis. In Williams' (1972) pilot study of several Puerto Rican children, the most conspicuous and frequent vowel error was the substitution of /a/ for /ə/

and /æ/. While this result was not confirmed in the present study, findings did support Williams' conclusion that the most pervasive consonant error was word-and-syllable final cluster simplification. Together these findings strongly suggest that in the teaching of English to Spanish-speaking children more attention should be paid to general patterns of response such as difficulty in discriminating final consonants.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study explored the relationship between standard English auditory discrimination and first-grade reading achievement for a group of Puerto Rican Spanish-speaking children. In mid-March 1974, 52 Ss were tested on one of two forms of an experimental auditory discrimination test consisting of minimal pairs expected to be difficult for Spanish-speakers to discriminate. Of these 52 Ss, 44 were tested by the school system on the Gates-MacGinitie Reading Test, Primary A, Form 1, the following May.

Low positive but significant correlations were found between scores on both forms of the auditory discrimination test and composite reading scores, between scores on both auditory discrimination test forms and vocabulary subtest scores, and between scores on Form II of the auditory discrimination test and comprehension subtest scores. A very low, and not significant, correlation was found between scores on auditory discrimination test Form I and comprehension subtest scores.

It may be concluded that for this S population

there was a modest positive relationship between reading achievement and auditory discrimination of standard English minimal pairs.

Analysis of the errors of the 52 Ss on the auditory discrimination test forms revealed that items specifically designated by contrastive analyses and prior research as particularly difficult for Puerto Rican Spanish-speakers were no more difficult for this S population than other items expected to be difficult for Spanish-speakers in general. Items with final phonemic contrasts were significantly more difficult for this population than the items with medial or initial contrasts.

While exploratory in nature, this study has served to suggest some possible avenues for future research:

1. The largest area needing research is the comparative study of the effects of phonological, syntactic, vocabulary, and intonational differences on reading.

2. Another fruitful area might be the exploration of the relationship between knowledge of English phonology and decoding ability.

3. An interesting extension of the present study would be to use the experimental auditory discrimination test as a single entity by dividing administration of the test into two separate sessions with each S.

4. Finally, it would appear worthwhile to design and evaluate an instrument for assessing familiarity with English phonology in a manner less difficult and more related to skills actually applied in classroom settings.

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APPENDIX A

INFORMAL INTERVIEW FORM

INFORMAL INTERVIEW

1. When you are at home, do you speak in Spanish to your mother and father?

   (¿En tu casa, hablas tú español con tu mamá y tu papá?)

2. In your house, do your mother and father speak Spanish with each other?

   (¿En tu casa, tu mamá y tu papá se hablan español?)

3. Do you talk in Spanish to your brothers or sisters?

   (¿Hablas español con tus hermanos o tus hermanas?)

4. Do you speak Spanish with your friends?

   (¿Hablas español con tus amigos y amigas?)

APPENDIX B

INCOME SCALE FOR FEDERAL LUNCH PROGRAM

Board of Education
9 South Stockton Street
Trenton, New Jersey

September 5, 1973

Dear Parent or Guardian:

The Trenton Public Schools serve nutritious meals every school day. Elementary students may buy a cold lunch for thirty-five (35) cents and Junior and Senior High students may buy lunch for forty-five (45) cents.

Children from families whose income is at or below those shown on the scale are eligible for free meals. If your income is greater than those shown, but you have unusually high medical bills, shelter costs in excess of 30 percent of your income, special education expenses due to the mental or physical condition of a child or disaster or casualty losses, your children may still be eligible.

Family Size Income Scale-School Year 1973-1974

Family Size	Free Meals
1	$ 2,740.00
2	3,600.00
3	4,460.00
4	5,310.00
5	6,100.00
6	6,890.00
7	7,600.00
8	8,310.00
9	8,960.00
10	9,600.00
11	10,240.00
12	10,880.00
Each additional family member	640.00

NOTE: Scale is based on gross income before deductions.

To apply for free meals for your children, at any time during the year, complete the attached application and return it to the school your children attend. The school will let you know whether or not your children are eligible within 7 days of receiving your application. If you do not agree with the school's decision, you have a

right to a fair hearing. This can be done by calling or writing--Thomas W. Mitchell, Secretary-Business Administrator, 9 S. Stockton Street, 396-7646.

In certain cases foster children are also eligible for these benefits. If you have such children living with you and wish to apply for such meals for them, please notify us or indicate it on the application.

All children are treated the same regardless of ability to pay. In the operation of child feeding programs, no child will be discriminated against because of his race, sex, color or national origin.

If we can be of any further assistance or if your income changes during the year, please contact us.

APPENDIX C

STANDARDIZED PRETRAINING SESSION

STANDARDIZED PRETRAINING SESSION

Today we are going to play a listening game with the tape recorder. The name of the game is "Same or Different." Before we start the game, can you show me which two beads are the same? [If successful, repeat with second set of beads. If unable to identify two identical beads, disqualify.] Good. Now can you show me two which are different? Good.

Now I am going to say two words to you. Listen to see if they sound the same or if they sound different. Then I will say the words again and you tell me "same" if they sound the same. Say "different" if they sound different. [If necessary, accept "same" and "not the same" or "yes" and "no."]

Here are two words. Remember to just listen the first time I say them . . . play, play . . . play, play. Did the words sound the same or different? [If correct, proceed. If wrong answer or no answer, repeat example. If child still misses, disqualify.] Good.

Now, let's try two more words . . . play, go . . . play, go. Did those words sound the same or different? [Same procedure as previous pair.] Good.

Let's try two more words . . . run, sun . . . run, sun . . . [Pause for child to respond. If he doesn't, prompt him with "same or different?" Same procedure as

previous pairs.]

Now we're going to use the tape recorder. The lady on the tape is going to say some words, just like I did. She'll say two words and you just listen. Then she'll say them again. After she says the words two times, then you tell me if they sound the same or different. I'll write down what you say. Remember, some of the words will be the same and some will be different. Okay? Good, now listen carefully.

Hoy vamos a jugar un juego y vamos a escuchar una cinta. El nombre del juego es "Suena igual (lo mismo) o diferente." Antes de empezar este juego me puedes enseñar cuál de estas cuentitas son iguales? Bien. ¿Ahora me puedes enseñar cuál de estas cuentitas son diferentes? Muy bien.

Ahora yo te voy a decir dos palabras inglèsas. Escucha a ver si suenan iguales o diferentes. Ahora yo voy a decir las dos palabras otra vez y dime "igual" si suenan iguales. Dime "diferente" si suenan diferentes.

Aquí hay dos palabras. Acuerda, sola escucha la primera vez que te las digo . . . play, play . . . play, play. ¿Sonaron las palabras iguales o diferentes? Bien.

Ahora vamos a probar dos palabras más . . . play, go . . . play, go . . . ¿Sonaron las palabras iguales o diferentes? Bien.

Vamos a probar dos palabras más . . . run, sun . . . run, sun. Bien.

Ahora nosostros vamos a escuchar la cinta. La Señora va a decir dos palabras y primero escucha. Después que ella diga las palabras dos veces, entonces contesta si el sonido es igual o diferente. Acuerda que algunas palabras son iguales y algunas son diferentes. Okay? Escucha con cuidado.

APPENDIX D

GATES-MACGINITIE READING TEST,

PRIMARY A, FORM 1

Print your name here .....

How old are you? .....

When is your birthday? .....

Grade ..... Date .....

School ..... Teacher .....

VOCABULARY SAMPLES

A.

did egg

dog two

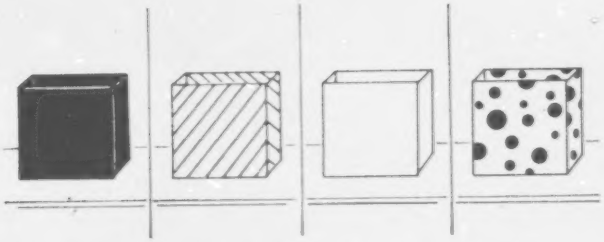
B.

bed swim

milk fly

COMPREHENSION SAMPLES

A. Where is the baby?



B. The white box is on the shelf.

A FORM 1

GATES–MacGINITIE READING TESTS

PRIMARY A, FORM 1

Vocabulary and Comprehension

TEACHERS COLLEGE PRESS
TEACHERS COLLEGE
COLUMBIA UNIVERSITY
NEW YORK

To the Teacher:

BE SURE to follow the directions in the Manual (included in each test package) when giving these tests. The directions will tell you how to explain the tests and how to work the sample items with the students. Allow the exact time specified in the Manual.

VOCABULARY

Number correct _____

Standard score _____

Percentile score _____

Grade score _____

COMPREHENSION

Number correct _____

Standard score _____

Percentile score _____

Grade score _____

© 1964 by Teachers College, Columbia University

Printed in U.S.A.

START HERE

Vocabulary

1.

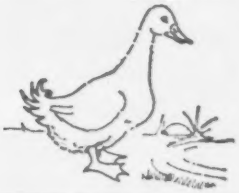
all pig

eye fly

2. **4**

foot soup

door four

3. 

duck fish

face rock

4.

made ball

girl cent

5.

bird bring

fire hard

6.

made ball

play baby

7.

had egg

eat not

8.

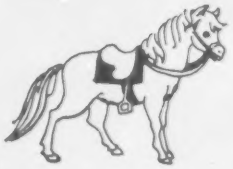
boy cow

arm bat

9.

tree draw

again train

10. 

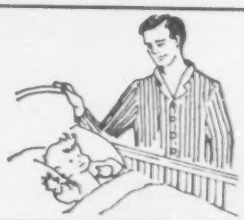
pair puppy

pony money

11.

bell bear

star read

12. 

father matches

fanning winter

13.

oven oxen

orange change

14.

help will

been bell

15.

say out

pig sit

16.

wolf talk

work wood

17.

frog flag

floor clap

18.

wheel wheat

what smell

19.

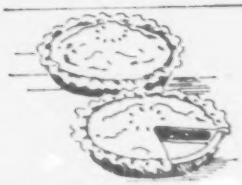
cook took

roof clock

20.

fight lost

light lifts

21. 

pies rock

pick pink

22.

lip stop

ship shoe

23.

liking walking

wanting talked

24

ride hide

hill made

25.

forty warmer

farmer falling

26.

stocking standing

splash something

27.

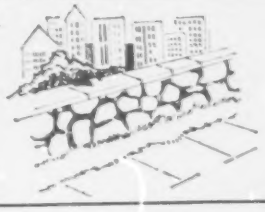
hall call

cart calf

28

wolf tail

take ship

29. 

wall want

talk roll

30.

bite wishes

wing write

31.

grass cross

loss crow

32.

rock rope

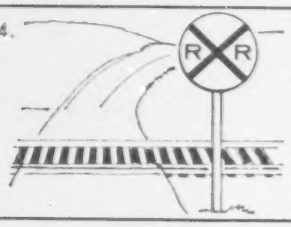
hose rose

TURN THE PAGE

33.

raining river

riding hiding

34. 

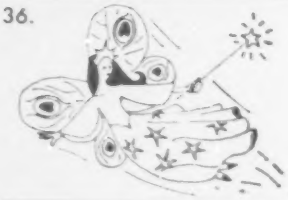
railroad railing

rib roast rainbow

35.

shake late

stick skate

36. 

family fair

pairs fairy

37.

dance daisy

prince down

38.

stone stand

stay alone

39.

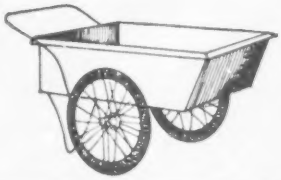
doctor dollar

donkey dolly

40.

ambulance American

adventure astronaut

41. 

card can't

part cart

42.

lamb camp

comb come

43.

hand land

fans lays

44.

fans back

mice face

45.

fix lip

lie tie

46.

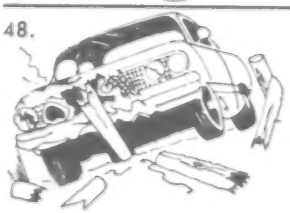
point prison

poison drown

47.

neighbor migration

mosquito microscope

48. 

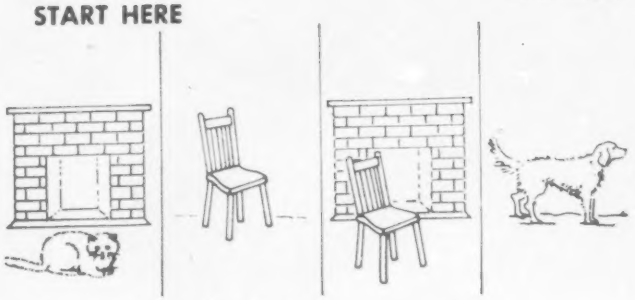
accept accident

addition sandwich

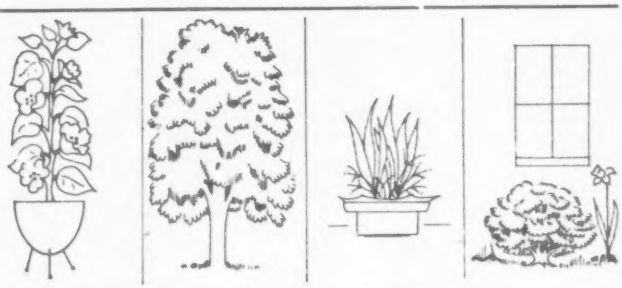
STOP

Comprehension

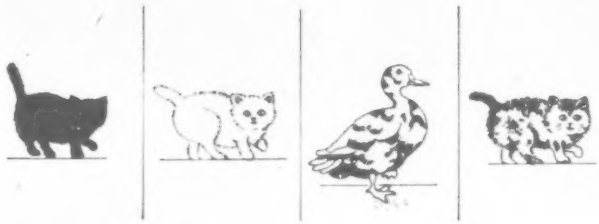
START HERE



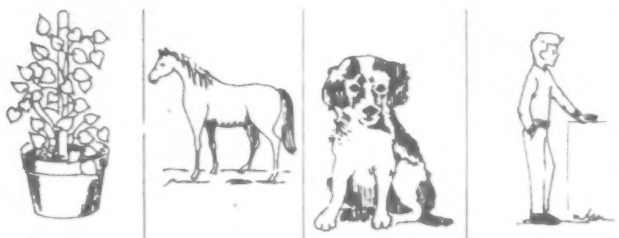
1. Mark the cat.



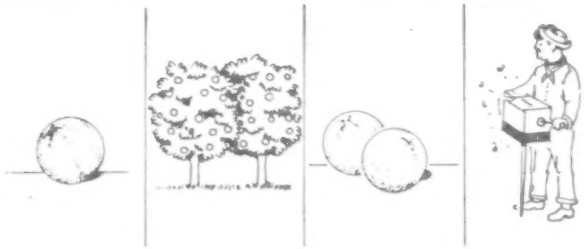
2. Which is the big tree?



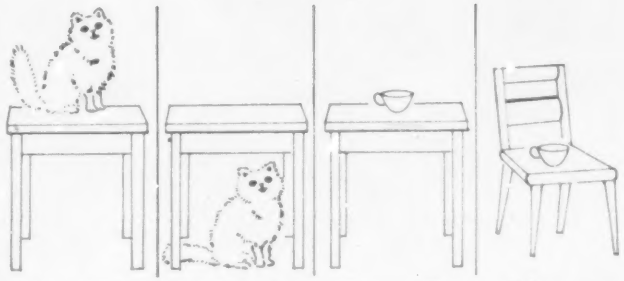
3. Here is the white kitten.



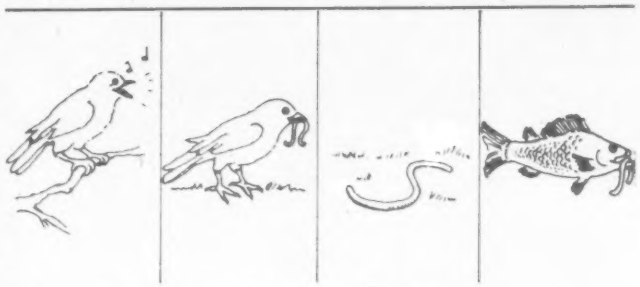
4. This is a boy.



5. Here are two oranges.

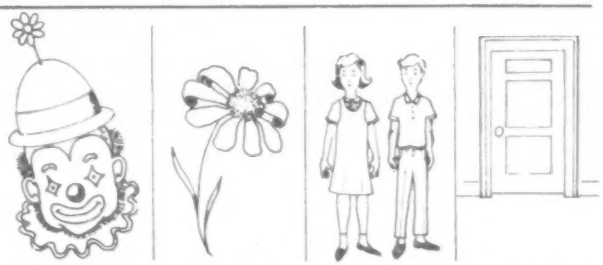


6. The cat is sitting on the table.

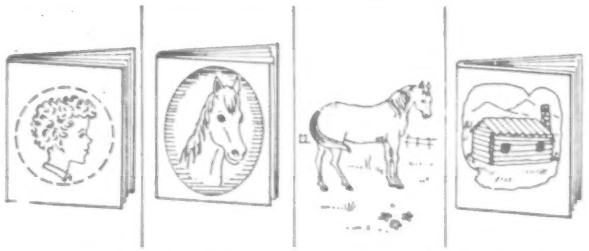


7. Mark the bird with a worm.

8. Who is reading from a little book?



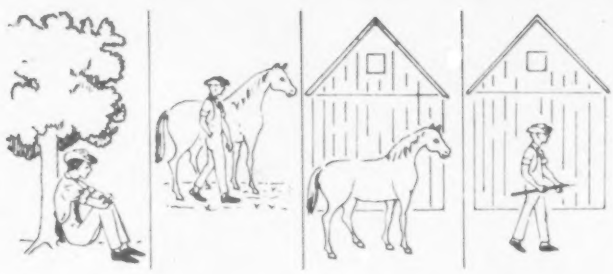
9. What made the children laugh so hard?



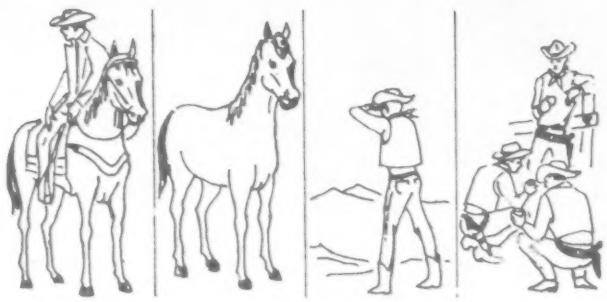
10. The book she wanted was about horses.

TURN THE PAGE

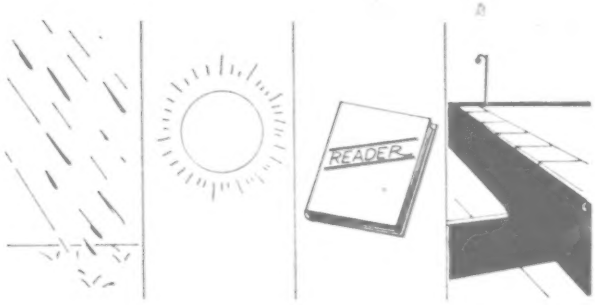
11. For breakfast he wanted a couple of fried eggs.



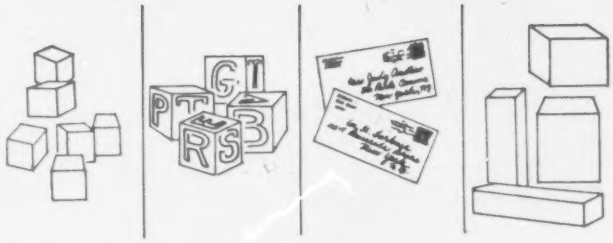
12. The farmer is walking near his barn.



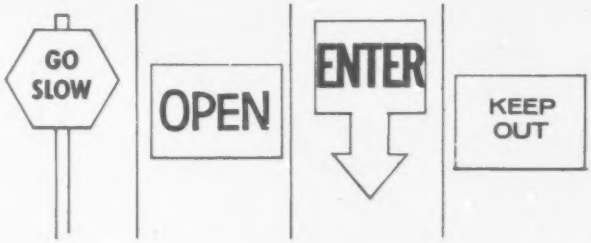
13. This cowboy has lost his horse.



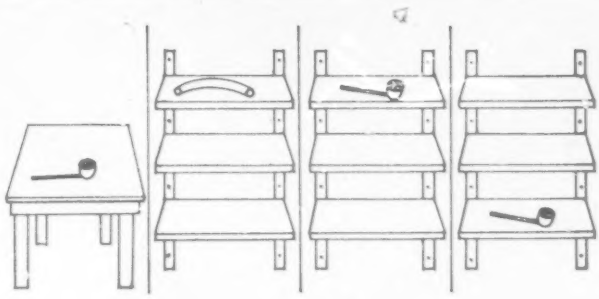
14. What will make the streets wet?



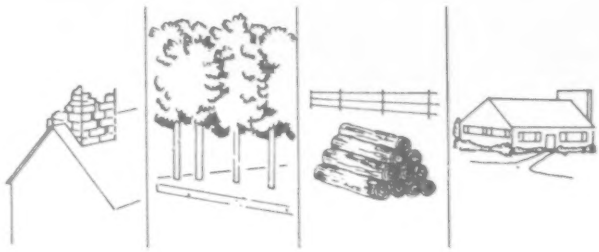
15. These blocks have letters on them.



16. Mark the picture of the sign that tells you not to go in.

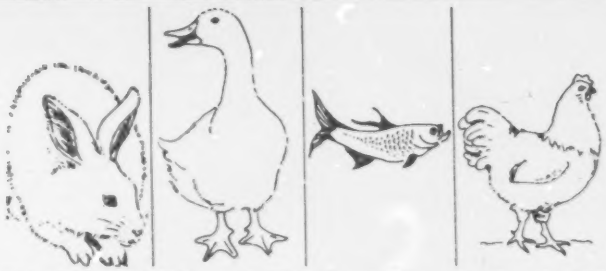


17. His best bubble pipe was on the top shelf.

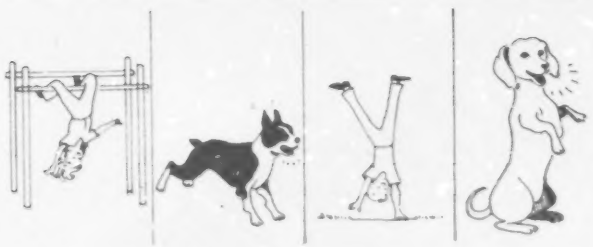


18. A strong wind caused damage to the chimney of our house.

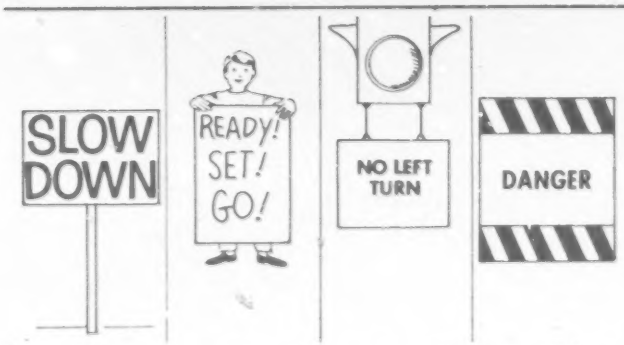
19. This boy is buying tickets to a movie.



20. The rabbit and the hen live on land. The fish lives in the water. The duck lives near the water. Which picture shows what lives in the water?



21. The dog that lives next door has learned several tricks. His latest trick is to sit up on his two hind legs and bark when he wants something to eat. Which trick has he just learned to do?

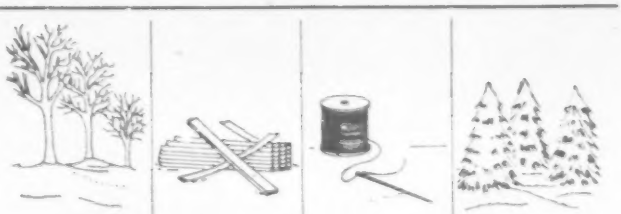


22. Mark the sign that means you should not turn left.

23. The snowman that lasted longest was the one that Jack made. It had four buttons, an umbrella, and a tall black hat.

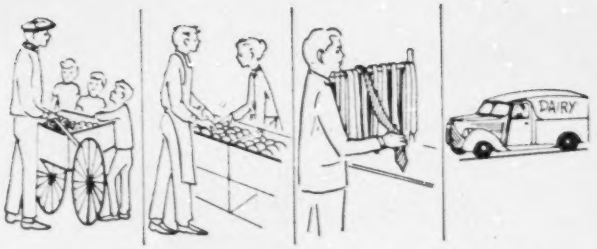
24. A boy had five cents. He went to buy some candy. On the way to the store he saw some big apples for sale. He got an apple. What did the boy get with his money?

25. Which sign means that skating is not allowed?



26. Firs, pines, and spruces are called evergreens because their needles stay green all year. These evergreen trees make good Christmas trees. They keep fresh for a long time after they have been cut.

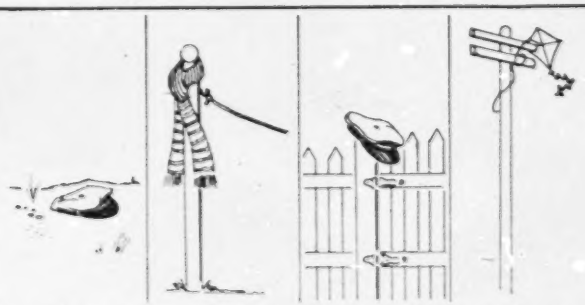
TURN THE PAGE



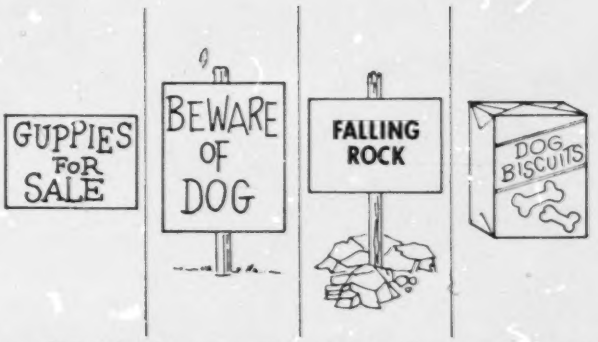
27. Every fine day Mr. Blake brought his cart to the corner. He sold peanuts and popcorn. After school, the boys often stopped to buy something. They often stayed for awhile to talk to Mr. Blake.

28. "Always wash your hands before eating," said Mother. One boy is doing what his mother told him to do.

29. This elephant is in a circus. He does funny things to make the children laugh. The children give him peanuts.



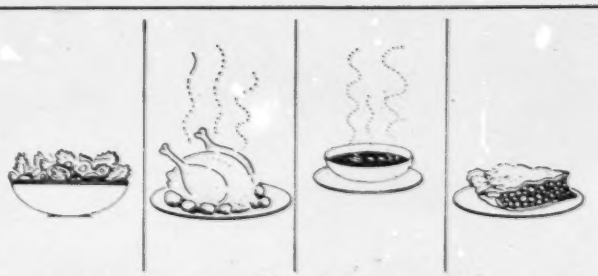
30. The strong wind during the storm had blown his new cap off the line. There it was on the gate post.



31. Which shows a sign that tells you to watch out for an animal?

32. Father should have his coat cleaned. He dropped some butter on it when he was eating. Where does Father need to go?

33. A man was looking for a house to live in. He passed many houses. Then he saw one which he might rent. He went into this house. Which house did he go into?



34. We had a big Thanksgiving dinner. First came soup and then turkey with vegetables. Last came pie and cheese. What was the first thing we ate?

STOP

APPENDIX E

PILOT AUDITORY DISCRIMINATION TEST

PILOT AUDITORY DISCRIMINATION TEST

1. lose-loose
2. mask-mass
3. save-saved
4. go-go
5. fault-fought
6. me-me
7. peace-pea
8. sin-sing
9. bat-back
10. jeep-cheap
11. pen-pan
12. sheep-ship
13. slam-slammed
14. grass-grasp
15. sing-thing
16. ski-see
17. tap-tab
18. dime-time
19. pat-pot
20. three-tree
21. them-then
22. car-cars
23. sip-zip
24. smile-mile
25. pup-pop
26. bark-bar
27. let-let
28. bit-pit
29. can-can
30. rubbed-rub
31. me-knee
32. up-up
33. set-sit
34. so-soul
35. game-came
36. closed-close
37. but-bought
38. pain-pen
39. bat-vat
40. so-saw
41. win-wind
42. will-will
43. not-not
44. play-play
45. bed-bet
46. chair-share
47. bag-back
48. witch-wish
49. mix-mixed
50. no-snow
51. full-fool
52. there-dare
53. leave-leaf
54. laugh-laughed
55. vat-fat

APPENDIX F

FINAL FORMS I AND II OF THE EXPERIMENTAL AUDITORY DISCRIMINATION TEST

AUDITORY DISCRIMINATION TEST FOR SPANISH-SPEAKING PUERTO RICAN CHILDREN

Form I	Form II
1. bag-back	1. pain-pen
2. smile-mile	2. bed-bet
3. saved-save	3. dime-time
4. go-go	4. go-go
5. ski-see	5. sheep-ship
6. game-came	6. laughed-laugh
7. closed-close	7. no-snow
8. mask-mass	8. jeep-cheap
9. full-fool	9. sip-zip
10. me-me	10. me-me
11. let-let	11. let-let
12. chair-share	12. bark-bar
13. vat-fat	13. pat-pot
14. bat-back	14. bit-pit
15. there-dare	15. three-tree
16. sin-sing	16. mix-mixed
17. bat-vat	17. slam-slammed
18. car-cars	18. me-knee
19. sing-thing	19. lose-loose
20. witch-wish	20. fault-fought
21. rubbed-rub	21. but-bought
22. can-can	22. can-can
23. so-saw	23. peace-pea
24. pen-pan	24. win-wind
25. so-soul	25. them-then
26. up-up	26. up-up
27. tap-tab	27. grass-grasp
28. pup-pop	28. leave-leaf
29. set-sit	

AUDITORY DISCRIMINATION AND READING ACHIEVEMENT OF PUERTO RICAN SPANISH-SPEAKING FIRST-GRADE STUDENTS

AN ABSTRACT OF A THESIS

SUBMITTED TO THE FACULTY

OF THE GRADUATE SCHOOL OF EDUCATION

OF

RUTGERS UNIVERSITY

THE STATE UNIVERSITY OF NEW JERSEY

BY

JUDITH ANN SPRINGER

IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE

OF

MASTER OF EDUCATION

COMMITTEE CHAIRPERSON: James Swalm, Ed.D.

NEW BRUNSWICK, NEW JERSEY JANUARY 1975

ABSTRACT

The purposes of this study were twofold: (1) to discover which standard English phonemes would be difficult for Puerto Rican Spanish-speaking first-grade students to discriminate, and (2) to determine whether these auditory discrimination problems would be related to their reading achievement. For use in this investigation, two forms of an experimental auditory discrimination test were developed. The tests consisted of minimal phonemic pairs expected to be difficult for Spanish-speakers to discriminate (e.g., chair-share).

Fifty-two Puerto Rican Spanish-surnamed students from six schools met the criteria for participation in the study, namely: having no speech or hearing defects, being from a Spanish-speaking home, being a native born Puerto Rican or having one native-born Puerto Rican parent, being able to complete successfully a standardized pretraining session. These children were randomly assigned to take one of two auditory discrimination test forms; half were randomly selected to be retested to determine the reliability of the tests. Forty-four of the students were given the Gates-MacGinitie Reading Test, Primary A, Form 1, to evaluate their reading achievement. Scores on the auditory discrimination tests were correlated with scores on the reading test.

Research results indicated modest positive correlations between scores on both forms of the auditory discrimination test and the reading composite and subtest scores. Five of six sets of correlations were significant at the .05 level. Test items which had been predicted to be particularly difficult for Puerto Rican speakers of Spanish were no more difficult than other items expected to be difficult for Spanish-speakers generally. Minimal pairs with phonemic contrasts in the final position were significantly more difficult than items with initial or medial contrasts.

The low significant relationship between auditory discrimination and reading scores was not inconsistent with results of previous studies with different populations. A breakdown of auditory discrimination test errors revealed deviations from some specific predictions of contrastive analyses and prior research results. This was taken as an indication that in teaching English to Spanish-speaking children, more attention should be paid to working on such general patterns of response as discrimination of final consonants.

COURSE WORK FOR MASTER'S DEGREE IN READING

RUTGERS UNIVERSITY

		Instructor
Fall, 1971		
299:561	Foundations of Reading Instruction	Dr. Kling
290:540	Introduction to Learning	Dr. Cox
290:501	Introduction to Educational Tests and Measures	Dr. Pascale
610:581	Reading Materials for Children	Dr. Van Orden
Spring, 1972		
299:564	Remedial Reading	Dr. Fry
299:565	Lab in Remedial Reading	Mrs. Goldsmith
Summer, 1972		
250:522	Introduction to English as a Second Language	Dr. Condon
Spring, 1973		
299:566	Seminar in Reading Research and Supervision	Dr. Kling
Fall, 1973		
290:513	Introduction to Early and Middle Childhood	Dr. Arnold
Spring, 1974		
299:599	Master's Thesis Research	Dr. Swalm

Instructor

Fall, 1974

299:599 Master's Thesis Research Dr. Swalm

Course work outside Rutgers University

Newark State College
Graduate School
Teacher Certification Program
Six Elective Credits Transferred
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Union, New Jersey
Teacher Certification Program

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1970-71 Trenton Public Schools
Cadwalader School
Trenton, New Jersey
Fifth Grade Teacher

1971-72 East Windsor Regional Schools
Ethel McKnight School
East Windsor, New Jersey
Title I Reading Teacher

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Highland Park, New Jersey
Editor